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Crew Resource Management (CRM)

Railroad Safety Advisory Committee

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Background and History

- Aviation community, late 1970's
- Researchers exploring human factors concerns pilots, address underlying factors causing "pilot accidents.
- Accident Analysis (1968 - 1976):
- Problems with decision-making, leadership, pilot judgment, communications, and crew coordinati

Several Accidents Illustrate This

- *B737 crashed at Chicago's Midway airport.*
- Crew became engrossed in a "problem" with an illuminated light;
- They lost "situational awareness" under great time pressure, forgot that speed brakes were employed.
- "Who's minding the store?"

Crew Resource Management (CRM)

- How to deal with incidents/accidents where skills of crewmembers are adequate ... but the coordination of the crew is lacking?

- *"Crew resource management is the effective utilization of all available resources - hardware, software, and 'peopleware' - to achieve safe, efficient flight operations."*

As a Result of Aviation Accidents:

- ## CRM training became mandatory in aviation after March 19, 1998, as described in 14 CFR Part 121.404:

    - *After March 19, 1998, no certificate holder may use a person as a flight crewmember, and after March 19, 1998, no certificate holder may use a person as a flight attendant or aircraft dispatcher unless that person has completed approved crew resource management training (CRM) or dispatcher resource management (DRM) initial training, as applicable, with that certificate holder or with another certificate holder.*

Marine Industry, Late 1980's

- Also history of accidents on ships operated by technically qualified crewmembers.

- Several people present on the bridge of a ship, each with specific responsibilities (Captain, Officers, Lookouts, Helmsman)

1973-76 Study of Accidents

- Competent licensed officers, clear weather, equipment okay
- Large percent due to human error
- *Conclusions:* Errors not *detected* and/or not *communicated* early enough

Several Accidents Illustrate This

- August 1992, passenger vessel *QE II*
- Inadequate planning and lack of communication between captain, pilot and the bridge crewmembers contributed to the accident.
- Without pre-departure conference, the crewmembers were unaware of the pilot's intentions.

ground off Mussel

As a Result of Maritime Accidents:

- *The 1995 Amendments to the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers (STCW) Convention require that the master and deck officers have a thorough understanding of bridge teamwork procedures (i.e., Bridge Resource Management)*

Railroad Industry

- Butler, Indiana accident (1998):
- Certified engineer and a conductor assigned to supervise a student engineer (but not qualified to be a trainer).
- Conductor stated it was the practice of *this crew* not to call clear signals
- (Student's dilemma: recent training says to call signals)
- Student operated independently for at least one half hour before the accident.

How CRM Helps?

- Provide strategies for challenging unsafe practices

- Reinforce the belief that each crewmember is a valuable resource

- Recognize loss of situation awareness, and what measures need to be taken

NTSB Recommendation R-99-13

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- *In coopera̶on with Class I railroads, the ASLRRA, the BLE, and the UTU, develop and require, for all train crewmembers, crew resource management training that addresses, at a minimum:*

- Crewmember proficiency,

- Situational awareness,

- Effective communication and teamwork,

- Strategies for appropriately challenging and questioning authority

CRM – New Concept in Railroad Industry

FRA conducted a review of CRM to examine:

- The history and background.
- Its procedures and concepts.
- The effectiveness of it in the airline industry.

Background and History

First generation – United Airlines 198 1

- "Cockpit Resource Management" -with emphasis on changing individual behavior relative to:

    1. Lack of assertiveness by juniors, and
    2. Authoritarian behavior by captains

Background and History

Third Generation – emerged in the early 1990's and the scope was broadened to:

- Include technical training.

- Focus on specific skills and behaviors that pilots could use to function more effectively.

- Coverage was also extended to address other groups such as; flight attendants, dispatchers and maintenance personnel.

Observations

The review indicated that:

- The third generation filled a need to extend the concept beyond the flight crew.

- May have had the unintended consequence of diluting the original focus that was placed on the flight crew.

Background and History

Second Generation – re-entitled "Crew
   Resource Management"

- Concept became more modular and team
  oriented in nature with focus on:

  - team building

  - briefing strategies

  - situation awareness

  -stress management

Background and History

Fourth Generation – identified as CRM – Integration and Proceduralization emerged with FAA's initiation of its Advanced Qualification Program (AQP).

- AQP is a voluntary program that allows air carriers to develop training specific to their organizational needs.

- In exchange for this flexibility, they are required to provide and integrate CRM into technical training for all flight crews.

- CRM training became mandatory in aviation in 1998.

Observations

Recapping the successes and failures of CRM through the first four generations indicate:

- CRM does not always reach everyone.

- Not all of its principles "move" from the classroom to the field.

- The basic concepts of CRM fade over time, if not practiced and reinforced.

- CRM is basically an "Error Management" program.

CRM As "Error Management"

CRM can be viewed as a set of error countermeasures with three lines of defense:

- The avoidance of error.
- Trapping the potential errors before they are committed.
- Mitigating the consequences of those errors which occur and are not trapped.

Observations

After the background study on **CRM**, **FRA** offers the following opinions:

- The "lessons learned" concerning the evolution of the process are invaluable, in event this concept would be applied to the railroad industry.

- "**Error** Management" is a strong, compelling and practical rationale for **CRM**.

- Many, but not all of the precepts of **CRM** can be found in the industry, both past and present.

Evolution of Safety and Training Programs in the Railroad Industry

- Program of Operational Tests and Inspections (49 CFR Section 217.9)
- Program of Instruction on Operating Rules (49 CFR Section 217.11)
- Qualification and Certification of Locomotive Engineers (49 CFR Part 240)
- Safety Training for Hazardous Materials Employees (49 CFR Part 172)

Focus of These Regulations

The primary objectives of these regulations are:

- Aimed toward important technical training aspects involving an employee's ability to perform his/her task.

- Only partially address the topics of "situational awareness", "effective communication and teamwork", and "strategies for appropriately challenging and questioning authority".

Examples of Current Training in the Railroad Industry

Many railroads go beyond the minimum standards set forth by Federal Regulations:

- CSX, as well as other railroads require a job briefing prior to each trip.

- UP requires "Session B" training which incorporates CRM principles.

- NS has an extensive video library and requires train crews to view selected videos.

Human Error Accident Reduction Training

= Coast Guard Prog

- FRA recognizes that there are aspects of CRM that may be applicable to the railroad industry.

- FRA also recognizes the need to improve the "safety culture" within the rail industry to support the principles and objectives of CRM.

An Improved Safety Culture

CRM is designed to develop a safety support system that:

- Encourages the making of safe operational decisions, and

- Stands behind those who make these decisions afterwards.

An Improved Safety Culture

- FRA's position is that no employee should be placed in a position where they must choose between maintaining their employment versus compromising their safety.

1997 FRA Roundtable

- At this "Intimidation and Harassment Roundtable, commitments were made to explore ways to improve the foll□▤ 'ngs qualities in the railroad work environment:

  - Trust

  - Dignity, and

  - respect

Roundtable Results

- This was the first step taken to bring about meaningful change within the rail industry's safety culture.

- FRA organized a railroad safety culture task force.

- FRA has addressed related issues through our SACP programs.

Conclusions

- FRA believes that CRM has many benefits that may well improve railroad safety, however our review discovered that these benefits are difficult to prove.

- FRA believes that CRM should be addressed through the RSAC process to fully evaluate the potential for developing and requiring its use.